

R E M A R K S

The claims in the case are claims 1-9. The claims have been amended to eliminate multiple dependency and to put them in better form for U.S. filing.

No new matter is included.

Favorable action is solicited.

Respectfully submitted,

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1. (original) A process for preparing 4-vinylcyclohexene, which comprises the steps
 - (a) providing an n-butane-containing feed gas stream,
 - (B) feeding the n-butane-containing feed gas stream into at least one dehydrogenation zone and dehydrogenating n-butane to butadiene to give a product stream comprising butadiene, n-butane, possibly 1-butene and 2-butene and possibly water vapor and other secondary constituents,
 - (C) feeding the product stream from dehydrogenation, if appropriate after separating off water vapor and secondary constituents, into a dimerization zone and catalytically dimerizing butadiene to give a product stream comprising 4-vinylcyclohexene, n-butane and possibly 1-butene, 2-butene and unreacted butadiene, and
 - (D) separating off 4-vinylcyclohexene from the product stream from the dimerization and recirculating n-butane and possibly 1-butene, 2-butene and unreacted butadiene to the dehydrogenation zone.
2. (original) A process as claimed in claim 1, wherein the provision of the n-butane-containing dehydrogenation feed stream comprises the steps
 - (A1) providing a liquefied petroleum gas (LPG) stream,
 - (A2) separating off propane and, if appropriate, methane, ethane and pentanes from the LPG stream to give a stream comprising butanes,
 - (A3) separating off isobutane from the stream comprising butanes to give the n-butane-containing feed gas stream and, if desired, isomerizing the isobutane which has been separated off to give an n-butane/isobutane

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mixture and recirculating the n-butane/isobutane mixture to the isobutane separation step.

3. (currently amended) A process as claimed in claim 1 or 2, wherein the dehydrogenation of n-butane to butadiene is carried out as an autothermal catalytic dehydrogenation.
4. (currently amended) A process as claimed in claim 1 or 2, wherein the dehydrogenation of n-butane to butadiene comprises the steps
 - (B1) feeding the n-butane-containing feed gas stream into a first dehydrogenation zone and catalytically, nonoxidatively dehydrogenating n-butane to 1-butene, 2-butene and possibly butadiene to give a product gas stream comprising butadiene, n-butane, 1-butene, 2-butene and possibly secondary constituents,
 - (B2) feeding the product gas stream comprising n-butane, 1-butene, 2-butene, possibly butadiene and possibly secondary constituents into a second dehydrogenation zone and oxidatively dehydrogenating 1-butene and 2-butene to butadiene to give a product gas stream comprising butadiene, n-butane, water vapor and possibly secondary constituents.
5. (original) A process as claimed in claim 4, wherein the catalytic, nonoxidative dehydrogenation of n-butane to 1-butene, 2-butene and butadiene is carried out as an autothermal dehydrogenation.
6. (currently amended) A process as claimed in claim 1 ~~any of claims 1 to 4~~, wherein water vapor and secondary constituents from the group consisting of

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hydrogen, carbon monoxide, carbon dioxide, nitrogen, methane, ethane, ethene, propane and propene are separated off from the product stream from the dehydrogenation prior to the dimerization.

7. (currently amended) A process for preparing ethylbenzene or styrene comprising the steps (A), (B), (C) and (D) as defined in claim 1 ~~any of claims 1 to 6~~ and the additional step
 - (E) feeding 4-vinylcyclohexene into a further dehydrogenation zone and catalytically dehydrogenating it to ethylbenzene or oxidatively dehydrogenating it in the presence of oxygen to give styrene.
8. (currently amended) A process for preparing styrene comprising the steps
 - (A) providing an n-butane-containing feed gas stream,
 - (F' B') feeding the n-butane-containing feed gas stream and a 4-vinylcyclohexene-containing gas stream into a dehydrogenation zone and jointly dehydrogenating n-butane and 4-vinylcyclohexene in the presence of oxygen to give a product stream comprising styrene, butadiene, n-butane, 1-butene, 2-butene, possibly ethylbenzene and further secondary constituents,
 - (G C') separating off styrene and, if applicable, ethylbenzene and further high-boiling secondary constituents from the product stream from the dehydrogenation,
 - (H D') feeding the stream comprising butadiene, n-butane, 1-butene and 2-butene into a dimerization zone and catalytically dimerizing butadiene to

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- give a product stream comprising 4-vinylcyclohexene, n-butane, 1-butene, 2-butene and possibly unreacted butadien,
- (t E') isolating the 4-vinylcyclohexene-containing gas stream from the product stream from the dimerization and feeding it into the dehydrogenation zone.
9. (original) A process as claimed in claim 8, wherein the joint dehydrogenation of n-butane and 4-vinylcyclohexene is carried out in the presence of a dehydrogenation catalyst comprising a noble metal of transition group VIII together with, if desired, one or more elements of main groups I and/or II, one or more elements of main group III including the lanthanides and actinides and/or one or more elements of main groups III and/or IV on a support.